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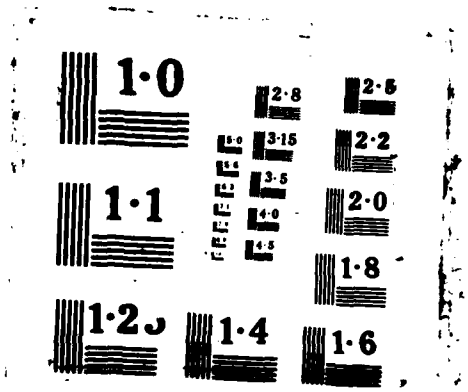
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DEVICE FOR MEASURING AERODYNAMIC FORCES

by

V. V. Bogdanov, S. T. Romashkin

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HUMAN TRANSLATION

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By: V. V. Bogdanov, S. T. Romashkin

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Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

GRAPHICS DISCLAIMER

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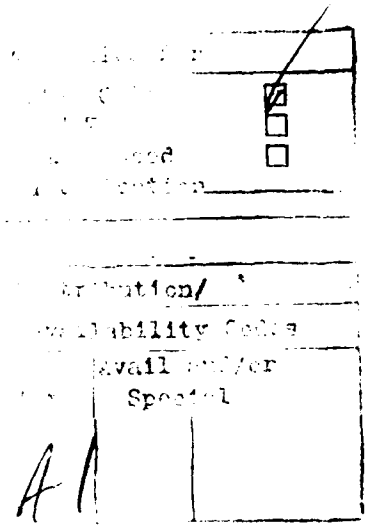

DEVICE FOR MEASURING AERODYNAMIC FORCES

V. V. Bogdanov, S. T. Romashkin

This invention is in the field of aerodynamic tests, and it is intended for use in wind tunnels for short-term action.

We know about devices for measuring aerodynamic forces which contain scales outside the models with force transducers and an accelerometer fastened to a holder or onto the housing of the scales. The signals from the transducers are added and supplied to a meter.

The problem with these devices is that they do not adequately compensate the signals for the oscillations of the holder and the vibrations of the scale housing.

The purpose of this invention is to eliminate this drawback. This is done by simultaneously introducing a correction for the linear and angular accelerations of the model measured with an accelerometer installed in the holder at the model attachment site.

The figure explains the principle of the invention.

The device consists of extramodel aerodynamic scales 2 installed on support 1.

The scales are rigidly connected with elongated holder 3, which

terminates in a conical mounting seat on which the model to be tested 4 is mounted. Accelerometer 5 is installed inside the holder at the point of its connection with the model.

Electrical signals proportional to the deformations of the sensors of the force transducer 6 are sent through adders 7 to the input of amplifiers 8, and from the output of the amplifiers - to the input of frequency filters 9. After filtration, the signals are recorded by galvanometers 10. The output signals of the accelerometer are sent to the signal separation unit 11, which isolates the signals proportional to the linear and angular accelerations of the model, respectively.

The signal separation unit consists of adders 12 and adjustable coefficient units 13 and 14 with mutually crossed connections. The signals from the output of the separation unit are sent to the input of unit 15 which compensates the signals for the inertial forces which act on the model. The compensation circuit consists of adjustable coefficient units 16 and 17 with mutually crossed connections, adjustable gain factor units 18 and 19, and adders 20.

The device operates as follows. The measured aerodynamic force, in the form of an exponential pulse ~ 0.1 s long with a steep leading edge, acts on the model. The effect of the pulse and vibrations of the support excite free low-frequency oscillations of the holder and high-frequency oscillations of the scales.

As a result, along with the valid component, the measured signals contain low-frequency and high-frequency oscillatory components.

After the signals have been amplified by the amplifier, the high-frequency component is filtered out by a low-frequency filter, while the valid signal is recorded by the galvanometer.

The signals of the tangential and linear accelerations are sent from the accelerometer to the signal separation unit. By

addition and subtraction, they are transformed into signals proportional to the linear and angular accelerations, respectively, in this unit.

The equality of the added or subtracted signals is obtained by the unit's controllable coefficient assemblies; thus, total mutual independence of the signals from the linear and angular accelerations is provided.

These signals are amplified with the appropriate controllable coefficients in the compensation unit, and they are added with the signals from the force transducers.

This device can be used in both three-component and six-component scales.

Subject of Invention

This invention is a device for measuring aerodynamic forces which contains aerodynamic scales with force transducers, an accelerometer with two sensors mounted in a holder, and a two-channel meter consisting of a series-connected adder, amplifier, frequency filter and recorder. It is different because in order to compensate for the low-frequency oscillations of the holder and vibrations of the housing of the scales, it has a unit for separating the signals of the linear and angular accelerations. This unit is a two-channel unit with adding amplifiers in each channel. It also has a two-channel compensation unit is series-connected with it through controllable elements, e.g., potentiometers. This compensator is built with adding amplifiers with a controllable gain factor in each channel. Both inputs of each amplifier of the signal separation unit are connected to the appropriate outputs of the accelerometer through controllable elements, e.g., potentiometers, and the outputs of the compensation unit - to the appropriate adders.

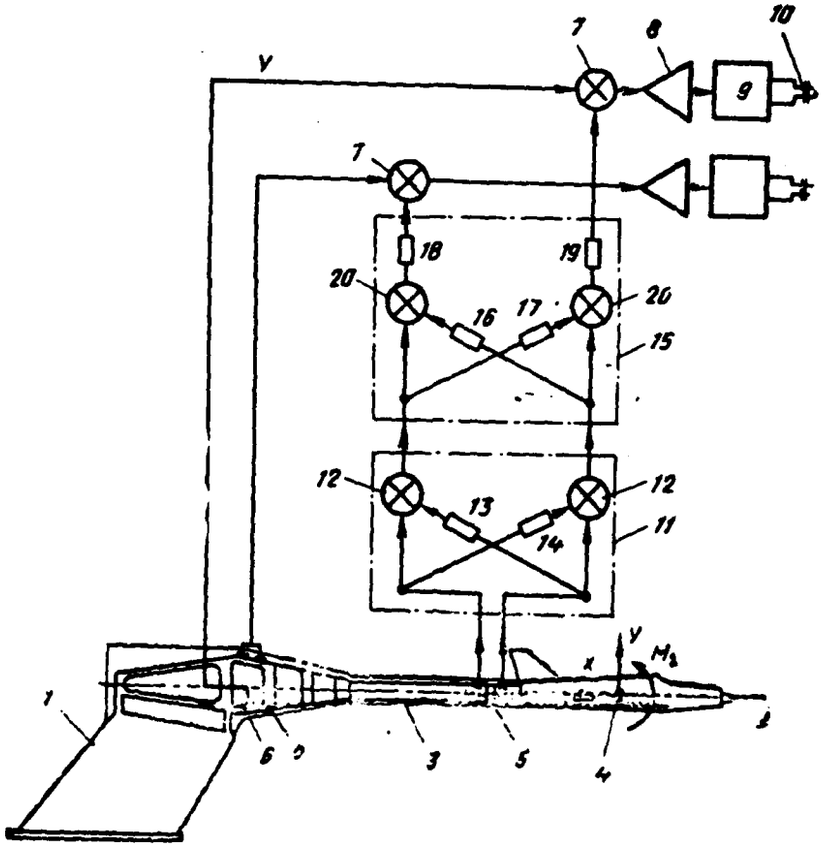

Figure.

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